Increasing passenger volumes present a challenge for security checks at airports.
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Going out with a bang

Vacation time is when airports are at their busiest. As the only independent German test center authorized to work with explosives in the service of aviation security, Fraunhofer ICT helps smooth the flow of traffic.

Text: Mehmet Toprak

When Dr. Dirk Röseling submits a report, he is not allowed to use mail, electronic or regular. He must travel to Paris and personally hand it over to the European Civil Aviation Conference (ECAC). That's because the contents are, quite literally, explosive.

Röseling is head of the Test Center for the Evaluation of Detection Systems for Explosives at the Fraunhofer Institute for Chemical Technology ICT. The institute is in a secluded location on the side of a hill in Pfinztal, not far from Karlsruhe. That seclusion is really a coincidence, but it's highly appropriate. Fraunhofer ICT operates the only independent test center in Germany allowed to use real explosives in its work. "We're also the only facility in Germany authorized to produce liquid explosives for test purposes," Röseling adds.

Aviation security is one of the principal concerns at the Fraunhofer ICT test center. Last year, 122.6 million passengers passed through Germany's 24 largest airports. Vacation time is when airports are at their busiest. According to DFS Deutsche Flugsicherung GmbH, the organization responsible for air traffic control in Germany, the busiest day in 2018 was September 7, with 3,079,093 passengers arriving and departing on commercial flights at German airports. Even on other days outside the peak period, it is common to see long lines of passengers waiting to have hand luggage screened. ▶

Suspect substances in luggage are marked on the scanner display.
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A test center worker places items of hand luggage in plastic trays.

▶ As soon as any stray water bottles have been disposed of, all electronic devices and metallic objects must be placed in a separate tray. This is because they interfere with today's scanner technology. According to Röseling, however, smart algorithms, greater computing power and, above all, better software mean that the latest generation of this technology is able to reliably scan luggage containing liquids and electronic appliances. This will speed up security checks for passengers and make things easier for airport operators, because they can now dispense with all the extra trays for laptops and mobile phones, etc.

Sarah Steinert packs a bag, first with items of clothing, then a toiletry bag containing toothbrush, toothpaste, perfume and various tubes of cream. Next comes a phone charger, insect-repellent spray and a travel alarm clock. Finally, she takes a gray-brown plastic bag containing 500 grams of nitroglycerin and slides it carefully between her iPad and a layer of T-shirts. Steinert is one of a team of 17 at the test center. She is used to dealing with high explosives such as nitroglycerin, TNT and Semtex. Her job is to test whether the scanner systems at airport baggage control are able to discover the explosives in her luggage. "I really enjoy my job," she says. "We're a great team, and the work is very varied."

Baggage scanners that pass all the tests at Fraunhofer ICT receive certification from the European Civil Aviation Conference (ECAC). Röseling helped develop the protocol that forms the basis for tests throughout Europe. He also works regularly with Germany's federal police, who supply him with details of new explosives or new combinations of explosives. Fraunhofer ICT then builds this information into its testing routines.

Visitors to the test center are immediately struck by the scale of the tests. Across the vast testing hall are mock baggage scanners with 100 or more cases, bags and rucksacks of varying shapes and sizes. Large steel shelves hold a huge array of bottles and cans. And a large table is crammed with jars of cosmetics, tubes of cream, aerosols and cleaning products. Steinert approaches with a trolley carrying various explosives. She and her colleagues will check whether the software of the scanner being tested is able to detect the explosives. Or whether any slip through the net. The test report will also refer to any false alarms.

More and more new explosives

Yet the test center is more than just a highly qualified service provider to the security industry. Much of its work also flows directly into research. In today's world, where terrorist organizations are always working to develop new explosives for bomb-making purposes, Röseling and his team are regularly required to analyze new chemical combinations or modified formulations of known substances. Their job is to find out whether today's scanning systems can detect them.

TNT? Semtex? Nitroglycerin? "I really enjoy my job!"

The team at Fraunhofer ICT checks whether scanner systems are able to detect hidden explosives in luggage.

A vast array of liquids and beverages is available for placing in luggage used to test the scanner.

Greater
efficiency and
lower costs
for baggage
control

An employee mixes liquid explosives.

A major research project in this field goes by the name of Accelerated Checkpoint Design Integration Test and Evaluation (XP Dite). Sponsored by the EU to the tune of 14.6 million euros, its objective is to incorporate all the various security technologies in this field within one integrated system, thereby enhancing safety while also increasing passenger throughput and convenience. In the future, the idea is that the security authorities will prescribe the level of security that airport operators must deliver. How they do that will be their own business. They will be at liberty to choose which technology and equipment they wish to install and to combine and connect different systems. XP Dite will provide a suite of planning tools and evaluation methods to assist with this process. The system-based approach will create greater efficiency and thus save airport operators money. By the same token, passengers will find the check-in procedure more convenient, with fewer steps and less waiting time.

At Fraunhofer ICT, each day goes out with a bang. Once testing has finished, the team must dispose of any unused explosives. A detonation chamber weighing 20 metric tons is used for this purpose. The explosives are placed within the chamber and detonated remotely. A dull thump is all that emanates from within.

Unused explosives are disposed of in a detonation chamber weighing 20 metric tons.